ABSTRACTOF THE DISCLOSURE

A hybrid protein (GFP-TTC) comprising the non-toxic proteolytic C fragment of tetanus toxin fused to green fluorescent protein was used to analyze the functional synaptic organization of neural networks. When injected intramuscularly *in vivo*, the GFP-TTC hybrid protein binds to tetanus neurotoxin receptors and clusters very rapidly to the active neuromuscular junction. Membrane traffic by GFP-TTC at the pre-synaptic level of the neuromuscular junction is strongly and rapidly influenced by exogenously co-injecting neurotrophic factors, such as BDNF, NT-4, and GDNF, but not by NGF, NT-3, and CNTF. The membrane traffic, directly detected using GFP-TTC *in vivo*, permits methods of analyzing synaptic functioning as well as methods of modulating neuronal transport using neurotrophic factors and agonists or antagonists thereof..

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